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Subject: Determination of Maximum Achievable Control Technology (MACT) Floor for New Medical Waste Incinerators
EPA Contract No. 68-D1-0115, ESD Project No. 90/17
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I. Introduction

The purpose of this memorandum is to define the MACT floor emission control levels for new medical waste incinerators (MWI's) and to discuss the methodology used to determine the MACT floor levels. The MACT floor emission levels for existing MWI's are presented and discussed in a separate memorandum.[1]

Section 129 of the Clean Air Act (Act) as amended in 1990 requires the U. S. Environmental Protection Agency (EPA) to establish new source performance standards for new MWI's that combust hospital waste, medical waste, and infectious waste. These standards must specify numerical emission limits for the following pollutants: particulate matter (PM), opacity, sulfur dioxide (SO_2), hydrogen chloride (HCl), oxides of nitrogen (NO_x), carbon monoxide (CO), lead (Pb), cadmium (Cd), mercury (Hg), and dioxins and furans (CDD/CDF). These standards must reflect maximum achievable control technology (MACT). According to the Act, the degree of reduction in emissions that is deemed achievable for new MWI's shall not be less stringent than the emissions control that is achieved by the best-controlled similar unit. This requirement that the standards be no less stringent than certain levels of emission control currently achieved is referred to as the MACT "floor."

The remainder of this memorandum defines the MACT floor emission levels for new MWI's and presents the rationale for selection of these levels. All of the MACT floor emission levels are based on analysis of the data from EPA-sponsored emission tests and additional data supplied by control equipment vendors. These emissions tests were conducted at facilities that use each of the major MWI control technologies. The control technologies consist of combustion controls alone or in combination with add-on air pollution control equipment. The achievable emission

levels associated with each of these technologies are presented in Table 1.

Combustion control technologies (the least efficient control) consists of temperature and residence time requirements in the secondary combustion chamber, and they destroy or prevent the formation of CDD/CDF, PM, and CO. Two levels of combustion control, the "1-sec" and "2-sec" levels, were evaluated. The control designations represent the gas residence time in the secondary chamber. Another difference is that the secondary chamber operating temperature is higher for the 2-sec control than for the 1-sec control. The emission levels for all of the add-on devices described below are for devices used in combination with 2-sec combustion control.

Compared to 2-sec combustion alone, wet scrubbers, typically venture scrubbers/packed bed (VS/PB) systems, achieve substantial reductions in HCl emissions, as well as PM, CDD/CDF, Pb, Cd, and Hg, but do not add to the control of CO, SO_2, and NO_x.

Fabric filter systems, typically dry sorbent injection followed by a fabric filter (DI/FF), provide additional control of Pb and Cd but does not add to the control of acid gases, CDD/CDF, CO, Hg, SO_2, and NO_x. In fact, wet scrubbers achieve greater reduction in HCl, Hg, and dioxin than DI/FF system without carbon. Injection of activated carbon in a DI/FF system results in lower dioxin than a wet scrubber. It is not known whether activated carbon could be used in conjunction with a wet scrubber to reduce dioxin. Additional information about the control systems and the achievable emission may be obtained from references 2, 3, 4, and 5.

II. MACT Floor for New MWI's

The MACT floor emission levels for the three MWI categories of new MWI's are shown in Table 2. The rationale behind the selection of these levels is presented in this section.

A. Small MWI's

The small MWI category consists of MWI's operating at a throughput of 200 pounds per hour (lb/hr) or less of medical waste. The MACT floor for new small MWI's consists of the emission levels that are achievable with good combustion followed by a moderate efficiency wet scrubber. The MACT floor is based on these emissions levels because at least one existing small MWI is equipped with this control equipment.[6-9] No small existing MWI's have been identified with high-efficiency wet scrubbers or dry scrubbers.

TABLE 1. ACHIEVABLE EMISSION LEVELS[2-5]
(Concentrations at 7 percent O_2)

Control Option	Pollutant									
			ng/dscm		ppmdv			mg/dscm		
	PM, gr/dscf	CO, ppmdv	CDD/CDF	CDD/CDF TEQ	HCl	SO	NO_x	Pb	Cd	Hg
Nonbatch good combustion	0.25	40	800	15	3,100	55	250	10	4.0	7.5
Batch good combustion	0.06	40	800	15	3,100	55	250	10	4.0	7.5
Wet scrubber										
low efficiency	0.05	40	125	2.3	15 or 99%	55	250	1.2 or 70%	0.16 or 65%	0.55 or 85%
moderate efficiency	0.03	40	125	2.3	15 or 99%	55	250	1.2 or 70%	0.16 or 65%	0.55 or 85%
high efficiency	0.015	40	125	2.3	15 or 99%	55	250	1.2 or 70%	0.16 or 65%	0.55 or 85%
DI/FF	0.015	40	800	15	70 or 95%	55	250	0.07 or 98%	0.04 or 90%	7.5
DI/FF w/carbon	0.015	40	25	0.6	70 or 95%	55	250	0.07 or 98%	0.04 or 90%	0.55 or 85%

TABLE 2. MACT FLOOR EMISSION LEVELS FOR SMALL, MEDIUM, AND LARGE MWI's
(Concentrations at 7 percent O_2)

Control Option	Pollutant									
			ng/dscm		ppmdv			mg/dscm		
	PM, gr/dscf	CO, ppmdv	CDD/CDF	CDD/CDF TEQ	HCl	SO	NO_x	Pb	Cd	Hg
Small	0.03	40	125	2.3	15 or 99%	55	250	1.2 or 70%	0.16 or 65%	0.55 or 85%
Medium	0.015	40	125	2.3	15 or 99%	55	250	0.07 or 98%	0.04 or 90%	0.55 or 85%
Large	0.015	40	25	0.6	15 or 99%	55	250	0.07 or 98%	0.04 or 90%	0.55 or 85%

B. Medium MWI's

The medium MWI category consists of MWI's operating at a throughput of greater than 200 lb/hr and less than or equal to 500 lb/hr of medical waste. The MACT floor for new medium MWI's is based on emission levels that are achievable with good combustion followed by a combination of two add-on control technologies, the high-efficiency wet scrubber and the DI/FF system without carbon. At least one existing facility in the medium category is controlled with a high-efficiency wet scrubber, and at least one MWI is equipped with a DI/FF system without carbon.[10-12] The MACT floor is based on both of these technologies because the wet scrubber achieves the lowest CDD/CDF, HCl, and Hg emissions, but the DI/FF without carbon injection achieves the lowest Pb and Cd emissions. The MACT floor emissions levels for the other pollutants can be achieved with either technology.

C. Large MWI's

The large MWI category consists of all MWI's operating at a throughput of greater than 500 lb/hr of medical waste. The MACT floor for new large MWI's is based on the emission levels that are achievable with good combustion followed by a combination of two add-on control technologies the high-efficiency wet scrubber and the DI/FF system with carbon. Several existing facility in the large category control emissions with a combined system.[13,14] In addition, one existing MWI is equipped with a SD/FF system carbon which was tested during the EPA test program. This facility met the emission levels presented in Table 2. The MACT floor is based on the emission levels achievable with the DI/FF system with carbon injection and the high-efficiency wet scrubber because the wet scrubber achieves the lowest HCl emissions, but the DI/FF with carbon injection achieves the lowest CDD/CDF, Pb, and Cd emissions. The MACT floor emissions levels for the other pollutants can be achieved with either technology.

III. References

1. S. Shoraka-Blair, MRI, to R. Copland, EPA/ESD. January 31, 1996. Determination of the Maximum Achievable Control Technology (MACT) Floor for Existing Medical Waste Incinerators that Incinerate General Medical Waste.

2. Memorandum from C. Hester, MRI, to R. Copland, EPA/ESD. May 20, 1996. PM, CO, and CDD/CDF Average Emission Rates and Achievable Emission Levels for MWI's with Combustion Controls.

3. Memorandum from B. Strong, MRI, to R. Copland, EPA/ESD. May 20, 1996. Acid Gases and Metals Typical Performance and Achievable Emission Levels for Medical Waste Incinerators with Combustion Controls.

4. Memorandum from M. Turner, MRI, to R. Copland, EPA/ESD. May 20, 1996. Wet Scrubber Performance Memorandum.

5. Memorandum from M. Turner, MRI, to R. Copland, EPA/ESD. May 20, 1996. Dry Scrubber Performance Memorandum.

6. D. Ferell, Texas Natural Resource Conservation Commission, to B. Strong, MRI. May 14, 1996. Fax transmittal of summary of stack sampling for Mercury Regional Medical Center, Laredo, Texas.

7. Stack Sampling Emission Report, VA Medical, Center Lake City, Florida. Prepared by Stenson and Associates. March 23, 1995.

8. B. Strong, MRI, to J. Mitchell, Park Place Memorial Hospital. February 23, 1996. Telecon: Discussion of wet scrubber operated at Park Place Memorial Hospital.

9. D. Ferell, Texas Natural Resource Conservation Commision, to B. Strong, MRI. May 31, 1996. Fax transmittal of summary of stack sampling for Sam Rayburn Memorial Hospital.

10. Compliance Test Report Norwalk Hospital Medical Waste Incinerator Emissions Test Program, Norwalk, Connecticut. Project No. L92-30. Prepared by ROJAC Environmental Services, Inc. August 27, 1993.

11. B. Strong, MRI, to J. Vettis, Syracuse Community General Hospital. February 23, 1996. Telecon: Discussion of DI/FF system operated at Syracuse Community General Hospital.

12. R. Parker, New York State Department of Environmental Conservation, to B. Strong. March 8, 1996. Summary of incinerator emission testing at Syracuse Community General Hospital.

13. Report on Compliance Testing Conducted for Hamot Medical Center, Erie, Pennsylvania. Clean Air Engineering. Project No. 5123. May 15, 1990.

14. J. Gaspar, Browning-Ferris Industries, to Rick Copland, EPA/ESD. Listing of medical waste incinerators operated by BFI.

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